



New species of the genus *Geogryllus* (Orthoptera: Gryllidae: Gryllinae) from Peru and Ecuador

Новые виды рода *Geogryllus* (Orthoptera: Gryllidae: Gryllinae) из Перу и Эквадора

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Abstract. The genus *Geogryllus* Otte et Perez-Gelabert, 2009 is recorded from South America. Three new species of this genus are described: *G. mezai* **sp. nov.** and *G. doderoae* **sp. nov.** from Peru as well as *G. nubilosus* **sp. nov.** from Ecuador. These species differ from other congeners mainly in the structure of male tegmina and male genitalia as well as in some peculiarities of the body colouration and the shape of head.

Резюме. Род *Geogryllus* Otte et Perez-Gelabert, 2009 указан для Южной Америки. Описаны три новых вида этого рода: *G. mezai* **sp. nov.** и *G. doderoae* **sp. nov.** из Перу, а также *G. nubilosus* **sp. nov.** из Эквадора. Эти виды отличаются от других представителей рода главным образом строением надкрылий и гениталий у самца, а также некоторыми особенностями окраски тела и формы головы.

Key words: crickets, taxonomy, South America, Orthoptera, Gryllidae, Gryllinae, Gryllini, *Geogryllus*, new species

Ключевые слова: сверчки, таксономия, Южная Америка, Orthoptera, Gryllidae, Gryllinae, Gryllini, *Geogryllus*, новые виды

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Introduction

This paper is partly an additional step in a large project on the invertebrate fauna of the Ene and Tambo river basins, founded by the National Service of Natural Areas Protected by the State (Servicio Nacional de Áreas Naturales Protegidas por el Estado) of Peru (Proyecto de Conservación de la Biodiversidad de la Selva Amazónica: Identificación taxonómica de la fau-

na invertebrada en la cuenca del Río Ene y Río Tambo).

The paper is devoted to one genus of crickets from the subfamily Gryllinae with all species described not from South America. This genus can be considered new for the region, and thus it significantly increases the diversity of the South American fauna of Gryllinae which contains not numerous genera compared to most other subfamilies of Gryllidae.

All the specimens studied are deposited in the collection of the Zoological Institute, Russian Academy of Sciences, Saint Petersburg (ZIN). These specimens are dry and pinned. Photographs of their morphological structures were taken with a Leica MZ16 stereomicroscope.

Taxonomic part

Tribe Gryllini

Subtribe Brachytrupina

Genus *Geogryllus* Otte et Perez-Gelabert, 2009

Type species *Geogryllus ochleros* Otte et Perez-Gelabert, 2009 (Jamaica), by original designation.

Note. This genus, “living in burrows”, was established for 20 species distributed in the Caribbean Islands (Otte & Perez-Gelabert, 2009). It includes three species previously described by Randell (1964a) in the genus *Gryllita* Hebard, 1935. Otte & Perez-Gelabert (2009) considered that the latter genus contains only North American species, but they did not indicate any characters for distinguishing these genera. Moreover, two species remaining in *Gryllita* (*G. arizonae* Hebard, 1935 from USA and *G. weissmani* Vickery, 1993 from Mexico) are rather similar to *Geogryllus* representatives in their general appearance and outlines of the male genitalia, but these genitalia in the above-mentioned species of *Gryllita* are insufficiently described (Randell, 1964b; Vickery, 1993) and do not allow us to dependably distinguish them from those of *Geogryllus*, *Rubrogeogryllus* Vickery, 1997 (with one species from Mexico; Vickery, 1997) and even *Miogeogryllus* Saussure, 1877 (with some species rather similar to representatives of *Geogryllus* in the general appearance). Thus, *Gryllita* and *Rubrogeogryllus* are in need of an additional study of their male genitalia for searches of generic differences from *Geogryllus*, *Miogeogryllus* and each other. At present, it is impossible to exclude that *Gryllita* and *Rubrogeogryllus* may be synonymous with *Geogryllus* or *Miogeogryllus*.

But *Miogeogryllus* and *Geogryllus* look more understandable, and their representatives differ from each other in the following characters of the male genitalia: in *Miogeogryllus*, the mesal lobes of ectoparameres have their posteroapical parts long (strongly projected behind the posterome-

dian margin of epiphallus), and the epiphallus sometimes has distinct (almost spine-like) or very small posteromedian projection; in *Geogryllus*, the ectoparameral mesal lobes have their posteroapical parts less long (not projected behind the posteromedian epiphallallic margin), and the epiphallus lacks any posteromedian projection but sometimes with a pair of very short posteromedian lobules.

Geogryllus mezei Gorochov et Izerskiy, sp. nov. (Figs 1, 5–9, 12–14, 21, 22)

Holotype. Male, **Peru**, *Junin Department, Satipo Prov.*, “Zona de amortiguamiento de la bosque de proteccion Pui Pui” near Alto Cuviriaki Vill., 11°11'06.0–07.0''S 74°51'50.0–51.0''W, 1100–1200 m, primary/secondary forest, forest floor at night, 27.XII.2018–2.I.2019, A. Gorochov (ZIN).

Paratypes. 1 male, same data as for holotype (ZIN); 1 female, same province, outskirts of Satipo Town, 11°15'55.0''S 74°39'02.6''W, 600–800 m, secondary forest, forest floor at night, 5–26.XII.2018, A. Gorochov & V. Izerskiy (ZIN).

Description. Male (holotype). Body rather large. Colouration brown with dark brown (almost black) epicranium, upper part of clypeus, mandibles, and pronotum; with light brown ocelli, median area on lower part of clypeus, all parts of maxillae and labium, sternites, most part of legs, and tegminal areas along proximal half of costal edges; with light greyish brown (semitransparent) areas between basal and distal parts of dorsal tegminal fields; and with slightly darkened (intermediate between brown and light brown) distal parts of femur and tibia in hind leg as well as base of cerci and most part of hind tarsus (denticles of its basitarsus almost completely black). Head very large, distinctly wider than pronotum, semiglobular but having two rather large and distinct anteromedian convexities (rostral and subrostral ones, but latter convexity located near clypeus; Fig. 6), and with obliquely flattened lateral surfaces between rostrum and posterior parts of genae (Fig. 1); genae in front very wide, distinctly wider than bases of mandibles and slightly wrinkled; eyes moderately small compared to head; ocelli in corners of very transverse triangle, lateral ones almost round, but median ocellus narrow (transversely stripe-like); rostrum between antennal cavities 2.2–2.3 times as wide as scape (Fig. 5). Pronotum moderately transverse, strongly widening to head, with

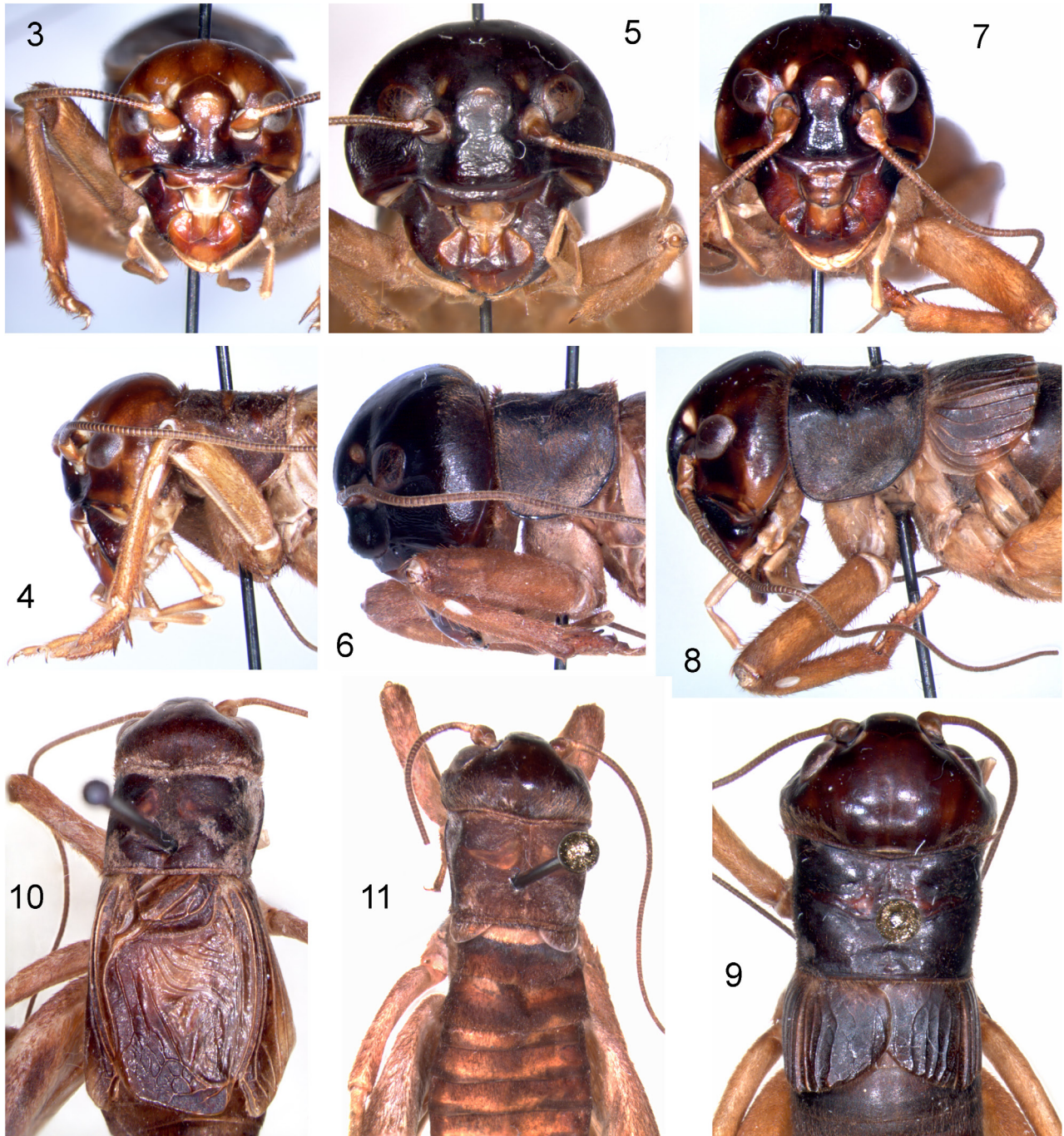


Figs 1, 2. *Geogryllus* spp., male body from above. 1, *G. mezai* sp. nov.; 2, *G. doderoae* sp. nov.

slightly concave anterior and posterior edges of disc as well as with lateral lobes high and having ventral edges almost straight and parallel to disc (Figs 1, 6). Legs strong but not short; fore tibia with only rather narrow and moderately long outer tympanum as well as three strong apical spurs and a pair of distinct but shorter (possibly digging) projections near them; fore basitarsus somewhat shortened (clearly shorter than middle basitarsus); hind leg with five pairs of strong articulated spines on tibial dorsum as well as five inner and six to seven outer dorsal denticles on basitarsus; other apical spurs typical of this tribe but also strong (two pairs on middle tibia, three pairs on hind tibia, and one pair on hind

basitarsus). Tegmina reaching middle part of sixth abdominal tergite; their dorsal field rather wide and having rather long stridulatory vein, two almost transverse oblique veins, normal chords and diagonal vein, not large triangular mirror divided into several cells, and short apical area having one branch and rounded distal edge (Fig. 1); lateral tegminal field high and with seven to eight longitudinal (more or less parallel) branches and rather sparse crossveins; hind wings invisible. Anal plate slightly longer than wide, rounded at apex; genital plate almost 1.5 times as long as anal one, gradually narrowing in distal half to narrowly rounded apex. Genitalia typical of *Geogryllus* but with following characteristic features: epiphallus with rather deep posteromedian notch having narrowly angular anterior part and lateral edges somewhat S-shaped, and with wide and moderately deep anteromedian notch between epiphallic apo-

demes (Figs 12, 21); each ectoparamere with anterior part (located before fusion with mesal lobe) approximately equal to posterior part (located after fusion with this lobe) in length, with mesal lobe somewhat longer than these ectoparameral parts, and with apex more or less rounded (Figs 13, 22); endoparameres not fused with each other and having very wide (in profile) apodeme in middle part (Figs 12–14, 21); sacculus rather large and with thin sclerotised ribbon along its median line (this ribbon fused with base of virga [= rachis] and having distinct elongate apodeme in place of this fusion; Figs 12, 14, 21); rami distinctly widened in their posterior parts (Figs 12, 13).



Figs 3–11. *Geogryllus* spp. **3, 4, *G. doderoae* sp. nov.;** **5–9, *G. mezai* sp. nov.;** **10, 11, *G. nubilosus* sp. nov.** Head in front, male (3, 5) and female (7); head with pronotum and fore leg from side, male (4, 6) and female (8); body without distal part from above, female (9, 11) and male (10).

Variations. Male paratype slightly smaller, with labrum having light brown area in basal part, with tegmina having almost dark brown basal and distal parts of dorsal field as well as brown region of chords, and with hind basitarsus having four inner and six outer dorsal denticles on both legs.

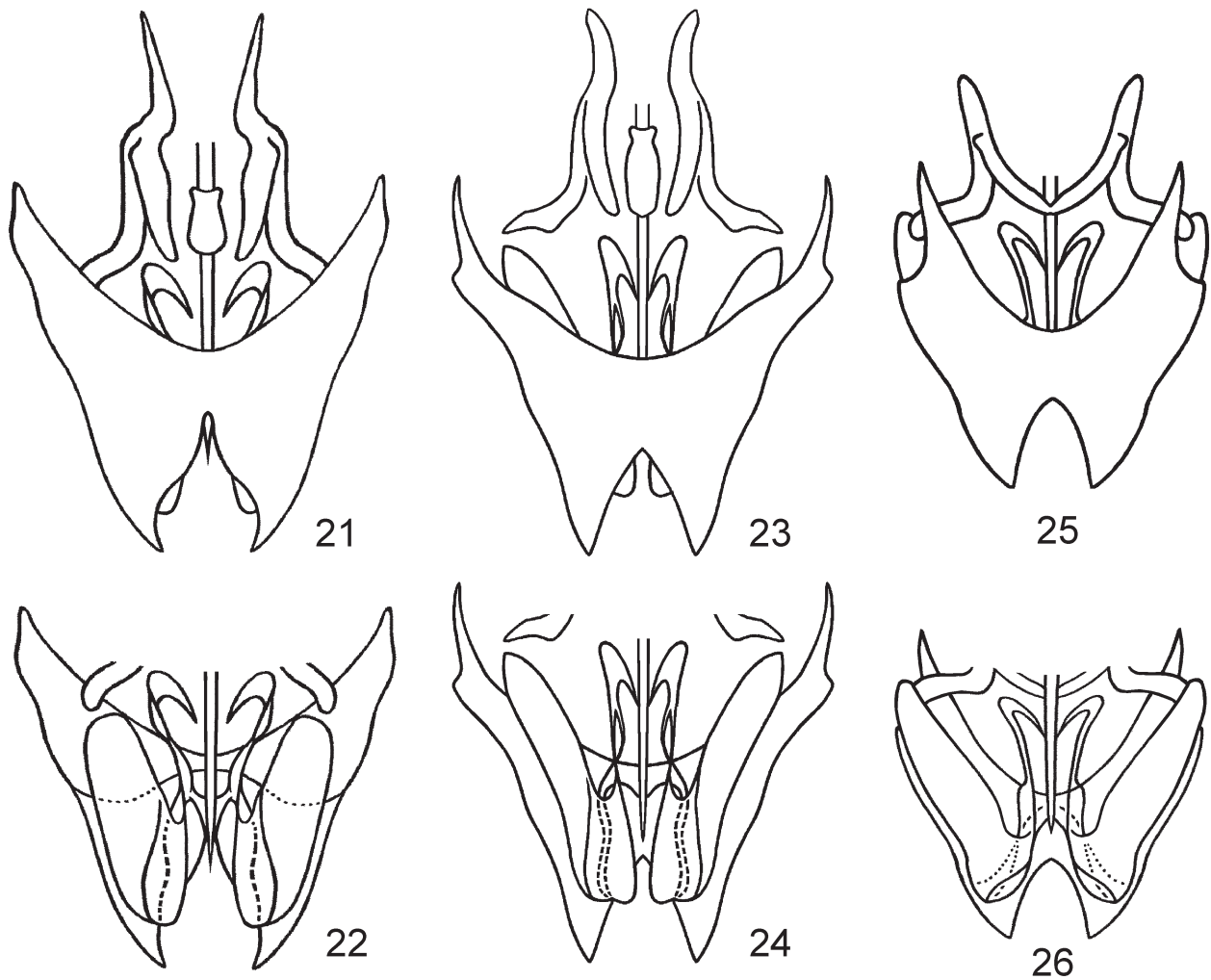
Female. General appearance as in male, but head somewhat less wide (but also wider than pronotum), with slightly smaller rostral convexity and almost indistinct subrostral one (Figs 7–9), with colouration of labrum as in male paratype, with mandibles mainly reddish brown (only their



Figs 12–20. *Geogryllus* spp., male. 12–14, *G. mezei* sp. nov.; 15–17, *G. doderoae* sp. nov.; 18–20, *G. nubilosus* sp. nov. Genitalia from above (12, 15, 18), from below (13, 16, 19) and from side (14, 17, 20).

basal parts dark brown), with pronotum having a pair of reddish brown spots on disc, with tegmina reaching middle part of first abdominal tergite and having 12–13 subparallel longitudinal veins only (lateral field with six to seven such veins, but

dorsal field with these veins less regular, and with sparse traces of crossveins; Figs 8, 9), and with hind basitarsus having six inner and seven outer dorsal denticles on both legs. Genital plate rather small, slightly longer than wide and somewhat



Figs 21–26. *Geogryllus* spp., male genital structures (schematically). **21, 22,** *G. mezei* **sp. nov.**; **23, 24,** *G. doderoae* **sp. nov.**; **25, 26,** *G. nubilosus* **sp. nov.** Epiphallus, ectoparameres, endoparameres or their parts, and rachis (= virga) from above (21, 23, 25) and from below (22, 24, 26).

narrowing to truncate apex; ovipositor moderately long, with subapical part barely widened in profile, and with apical parts of upper and lower valves rather thin and acute.

Length in mm. Body: male 22–25, female 22; pronotum: male 3.7–4, female 4.2; tegmina: male 9.5–10.5, female 4; hind femora: male 14.2–16, female 16.5; ovipositor 14.

Comparison. The new species differs from all the Caribbean congeners with studied males in the posteromedian epiphallic notch distinctly narrower in its anterior part. From *Gryllita arizonae*, it is distinguished by the male head much wider, male tegmina comparatively shorter, and mirror in these tegmina divided into several cells;

from *G. weissmani*, by the ectoparameral mesal lobes with the posteromedial apices not projected behind the epiphallic posteromedian edge; and from *Rubrogeogryllus*, by the posteromedian epiphallic notch narrower and less rounded in its anterior part, and distinctly larger female tegmina. From the congeners without known males, the new species differs in the more widened head in combination with dark colouration of head and pronotum as well as with rather long (not shortened) ovipositor.

Etymology. The new species is named in honor of the Peruvian public figure Dr Ivan Olivera Meza, who supported different research programs in the Central Peruvian Selva during many years.



Fig. 27. Burrow of *Geogryllus mezei* sp. nov., whose male was sitting inside this burrow during its calling.

Remarks. The both males were collected during their calling: each sang inside a soil burrow near its open entrance (Fig. 27); their calling songs were presented by very loud and long trills.

***Geogryllus doderoae* Gorochov et Izerskiy, sp. nov.**

(Figs 2–4, 15–17, 23, 24)

Holotype. Male, **Peru**, *Junin Department, Satipo Prov.*, Pampa Hermosa Distr., environs of Cristal Waterfall near Pacasmayo Vill., 11°22'02" S, 74°41'55" W, 1400–1600 m, primary forest, in mouldering wood at night, 8–13.XII.2018, A. Gorochov (ZIN).

Description. Male (holotype). Body insignificantly smaller than that of *G. mezei* sp. nov. Colouration lighter than in this species: epicranium reddish brown, with poorly distinct lightish longitudinal stripes on dorsum, spot under median ocellus and vertical marks on lower parts of genae, with dark brown area near clypeus (under above-mentioned lightish spot), and with yellowish ocelli; clypeus brown, with almost whitish lower part; mandibles brown to dark brown; la-

brum almost orange; maxillae and labium as well as scape and a few most basal segments of antennal flagellum light brown; rest part of this flagellum greyish brown; pronotum brown, with barely lighter anteroventral corners of lateral lobes and a pair of light brown spots on disc; sternites and legs also light brown but with slightly darkened (almost brown) distal part of hind femur and dark brown denticles of hind basitarsus; tegmina with dark brown distal third of dorsal field and light greyish brown other parts of this field, as well as with brown lateral field having light (cream) band along costal edge; rest parts of abdomen greyish brown to almost light greyish brown. Head similar in shape to that of *G. mezei* but less wide (slightly wider than pronotum), less convex in rostral region, virtually without subrostral convexity and almost not flattened between rostrum and posterior parts of genae (Figs 2–4); rostrum between antennal cavities approximately 1.8 times as wide as scape. Thorax, legs and wings distinguished from those of this species only by pronotum less strongly widening to head, outer proximal spine

of hind tibia small or absent, hind basitarsus with four to five inner and seven outer denticles, and tegmina reaching seventh abdominal tergite and with following structure of dorsal field: oblique veins more numerous (three instead two), diagonal vein distinctly shorter, mirror longer and more oblique (Fig. 2). Abdominal apex (including genitalia) also similar to that of *G. mezei* but with following differences: epiphallus with somewhat less deep posteromedian notch having almost straight lateral edges, and with anteromedian notch also slightly less deep (Figs 15, 23); each ectoparamere with anterior part (before fusion with mesal lobe) distinctly longer than posterior part (after this fusion) and barely shorter than mesal lobe, and with apex almost truncate (Figs 16, 24); endoparameres distinguished from those of this species by much narrower (in profile) apodeme in middle part; sacculus with almost invisible median sclerotised ribbon (Fig. 17); rami practically not widened in their posterior parts (Figs 15, 16).

Female unknown.

Length in mm. Body 21.5; pronotum 3.5; tegmina 10; hind femora 14.5.

Comparison. The new species differs from all the other congeners and similar taxa with known males in the same characters as *G. mezei* **sp. nov.** (except for the female characters). Its differences from *G. mezei* are named above, in the description of *G. doderoae* **sp. nov.** From the congeners without known males, the new species is distinguished by the head clearly wider or less uniformly dark, and/or with darker mandibles and pronotum.

Etymology. This new species is named in honor of the Minister of Agriculture and Irrigation of Peru, Lwr. Fabiola Muñoz Dodero, who provides great support to programs for the biodiversity and ecosystem conservation in the Amazonian forests of Peru.

Remarks. The male studied was collected during its calling: it sang inside a big mouldering stump and jumped out after a strong blow to this stump; its calling song is somewhat similar to that of *G. mezei* but slightly less loud.

***Geogryllus nubilosus* Gorochoy, sp. nov.**

(Figs 10, 11, 18–20, 25, 26)

Holotype. Male, **Ecuador**, western slopes of Andes in environs of Puerto Lopes Town, 10 km E of Agua Blanca Vill., San Sebastian Natural Boundary, 700 m,

cloud forest at night, 26–29.X.2005, A. Gorochoy & A. Ovtshinnikov (ZIN).

Paratype. Female, same data as for holotype (ZIN).

Description. Male (holotype). Body medium-sized for this genus. Colouration brown with following marks: head and pronotum dark brown, with brown area under median ocellus (but distinctly not reaching clypeus), with light brown ocelli, antennae and genae under eyes, and with also light brown mouthparts having brown upper part of clypeus and bases of mandibles as well as yellowish (almost whitish) palpi; tegmina brown, with light brown (semitransparent) middle part of dorsal field, and with light greyish stripe along costal edge (this stripe somewhat widened at base); legs uniformly light brown, with darkened apices of spines and spurs only; body venter light brown, with almost brown distal half of genital plate; posterior tergites of abdomen brown, uniform; anal plate and cerci intermediate between brown and light brown but with a pair of small darker spots near cerci and with light brown to yellowish cercal bases. Head typical of Gryllinae, i.e. almost completely semiglobular (but slightly higher than wide in front) and not wider than pronotum (Fig. 10); rostral convexity weakly projected forwards, widely rounded in profile; subrostral convexity absent; rostrum between antennal cavities approximately twice as wide as scape; eyes and ocelli almost as in *G. doderoae* **sp. nov.** Pronotum clearly transverse (Fig. 10), with parallel lateral edges of disc and with lateral lobes as in *G. doderoae*. Tegmina reaching base of seventh abdominal tergite, with four to five strongly S-shaped oblique veins, and almost not curved chords; diagonal vein more longitudinal than in *G. mezei* **sp. nov.** and *G. doderoae*, moved in medial half of this field; mirror transversely triangular but rather small and divided into a few cells by additional crossveins; apical area very short and more or less obliquely truncated; lateral tegminal field with seven to eight parallel longitudinal branches, but distal part of R with one to two small additional branches (Fig. 10). Legs and abdomen very similar to those of these previous species, but hind tibia with six pairs of dorsal spines, hind basitarsus with four to five inner and five outer dorsal denticles. Genitalia similar to those of both previous species described here but with following differences: epiphallus

with posteromedian notch more wide (roundly angular) in anterior part and almost as deep as such notch in *G. doderoae*, and with anteromedian notch clearly narrower than in both these species and almost as deep as in *G. mezai* (Figs 18, 25); each ectoparamere with anterior part (before fusion with mesal lobe) much longer than posterior part (after this fusion), with apex rounded, and with mesal lobe approximately twice as long as posterior ectoparameral part and slightly shorter than anterior ectoparameral part (Figs 19, 26); endoparameres fused with each other (i.e. not as in both previous species) and with moderately wide (in profile) apodeme in middle part (Figs 18, 20, 25); sacculus smaller than in these species and with sclerotised ribbon almost as in *G. mezai* (however, apodeme in place of fusion of this ribbon with base of virga much smaller than in both previous species; Fig. 18, 20, 25); rami more or less similar to those of *G. doderoae* (Figs 18, 19).

Female. General appearance as in male, but: ocelli with light brown areas around them; tegmina roundly scale-like and not contacted with each other as well as reaching base of metanotum; hind wings absent; tegmina and mesonotum light brown; more posterior tergites brown, with a pair of transverse lightish stripes on each abdominal tergite; genital plate and cerci light brown, with lighter cercal bases. Genital plate roundly quadrangular but with barely narrowed and slightly notched apical part; ovipositor somewhat longer (compared with length of hind femur) than in *G. mezai*.

Length in mm. Body: male 18.5, female 15.5; pronotum: male 3.8, female 3.5; tegmina: male 8.2, female 0.7; hind femora: male 13.5, female 11.7; ovipositor 12.

Comparison. Differences of this species from the two species described here are given in the description of *G. nubilosus* **sp. nov.** The new species also differs from the other true and possible congeners in the same characters of epiphallus

as *G. mezai* and *G. doderoae* as well as narrower head, darker pronotum, numerous and strongly S-shaped oblique veins in the male tegmina, and shorter female tegmina or longer ovipositor.

Etymology. This species name is the Latin word *nubilosus* (cloudy), given in connection with its type locality situated in a mountain cloud forest.

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